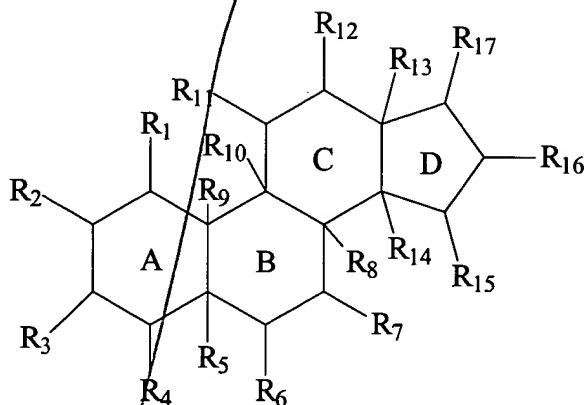


What is claimed is:

1. A compound according to formula I



I

wherein:

fused rings A, B, C, and D are independently saturated or fully or partially unsaturated; and

W. B. STEVENSON

R₁ through R₄, R₆, R₇, R₁₁, R₁₂, R₁₅, R₁₆, and R₁₇ is each independently selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkylamino, (C1-C10) alkylamino-(C1-C10) alkylamino-(C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted arylamino-(C1-C10) alkyl, (C1-C10) haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, oxo, a linking group attached to a second steroid, a substituted or unsubstituted (C1-C10) aminoalkoxy, a substituted or unsubstituted (C1-C10) aminoalkoxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxamido, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkoxy, (C1-C10) cyanoalkoxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkoxy, (C1-C10) quaternaryammoniumalkylcarboxy, and (C1-C10) guanidinoalkyl carboxy, where Q5 is a side chain of any amino acid, P.G. is an amino protecting group, and

R₅, R₈, R₉, R₁₀, R₁₃, and R₁₄ is each independently:

deleted when one of fused rings A, B, C, or D is unsaturated so as to complete the valency of the carbon atom at that site, or

selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, a

substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, C1-C10 haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, a linking group attached to a second steroid, a substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, H₂N-HC(Q₅)-C(O)-O-, H₂N-HC(Q₅)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q₅)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy, where Q₅ is a side chain of any amino acid, P.G. is an amino protecting group, and

provided that at least two of R₁ through R₁₄ are independently selected from the group consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy, (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted arylamino- (C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, (C1-C10) quaternaryammonium alkylcarboxy, H₂N-HC(Q₅)-C(O)-O-, H₂N-HC(Q₅)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q₅)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy; or a pharmaceutically acceptable salt thereof.

2. The compound of claim 1, wherein at least one of the following pairs is deleted and the valency of the ring carbon atoms at these deleted positions is completed with a double bond: R₅ and R₉; R₈ and R₁₀; and R₁₃ and R₁₄.

3. The compound of claim 1, wherein at least three of R₁ through R₁₄ are independently selected from the group consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy, (C1-C10) alkylcarboxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxamido, a substituted or unsubstituted arylamino- (C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, H₂N-HC(Q₅)-C(O)-O-, H₂N-HC(Q₅)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, (C1-C10) quaternaryammoniumalkylcarboxy, P.G.-HN-HC(Q₅)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy.

4. The compound of claim 3, wherein the 3 of R₁ through R₁₄ independently selected from the group consisting of a substituted or unsubstituted (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10)

alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted arylamino- (C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, and (C1-C10) quaternaryammoniumalkylcarboxy.

5. The compound of claim 1, wherein the second steroid is a compound of formula I.

6. The compound of claim 1, wherein the linking group is (C1-C10) alkyl-oxy-(C1-C10) alkyl.

7. The compound of claim 1, wherein none of R₅, R₈, R₉, R₁₃, and R₁₄ is deleted.

8. The compound of claim 1, wherein each of R₃, R₇, and R₁₂ is independently selected from the group consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxamido, H₂N-HC(Q₅)-C(O)-O-, H₂N-HC(Q₅)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkylcarboxy, P.G.-HN-HC(Q₅)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy, where Q₅ is a side chain of any amino acid, P.G. is an amino protecting group or a pharmaceutically acceptable salt thereof.

9. The compound of claim 8, wherein R₁, R₂, R₄, R₅, R₆, R₈, R₁₀, R₁₁, R₁₃, R₁₄, R₁₅, and R₁₆ are hydrogen.

10. The compound of claim 9, wherein R₁₇ is -CR₁₈R₁₉R₂₀, where each of R₁₈, R₁₉, and R₂₀, is independently selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, (C1-C10) haloalkyl, (C2-C6) alkenyl, (C2-C6) alkynyl, oxo, and a linking group attached to a second steroid.

11. The compound of claim 8, wherein each of R₃, R₇, and R₁₂, is independently selected from the group consisting of -O-(CH₂)_n-NH₂, -O-CO-(CH₂)_n-NH₂, -O-(CH₂)_n-NH-C(NH)-NH₂, -O-(CH₂)_n-N₃, -O-(CH₂)_n-CN, where n is 1 to 3, and -O-C(O)-HC(Q₅)-NH₂, where Q₅ is a side chain of any amino acid.

12. The compound of claim 8, wherein each of R₃, R₇, and R₁₂, is -O-CO-(CH₂)_n-NH₂, where n is 1 to 4.

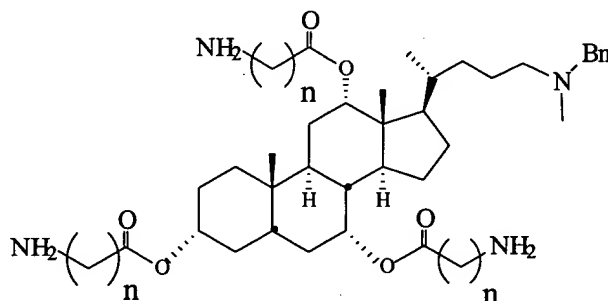
13. The compound of claim 12, wherein R₁₇ is -CH(CH₃)(CH₂)₃-O-(CH₂)_n-NH₂, wherein n is 1-7.

14. The compound of claim 12, wherein R¹⁷ is -CH(CH₃)-(CH₂)_n-NR¹R², wherein n is 0-2, R¹ and R² are independently (C1-C6) alkyl, aryl or aralkyl.

15. The compound of claim 1, wherein R¹⁷ is -CH(CH₃)(CH₂)_{n1}-CO-OR³, where R³ is selected from -(CH₂)_{n2}N⁺(CH₃)₃, wherein n1 and n2 are independently 1-4.

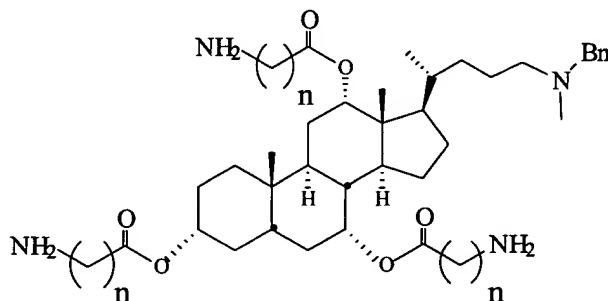
16. The compound of claim 15, wherein R³, R⁷, and R¹² are -O-C(O)-(CH₂)_n-NH₂, wherein n is 1-5.

17. The compound of claim 1 having the following formula:



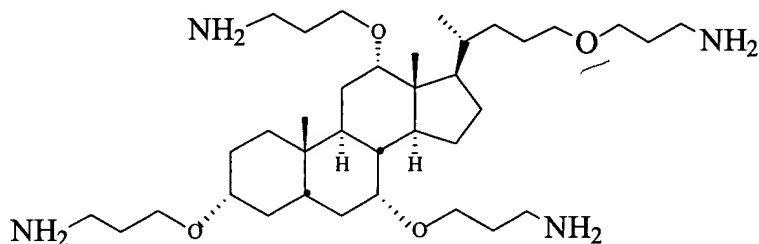
wherein n is 1-3, and Bn is a benzyl group.

18. The compound of claim 1 having the following formula:

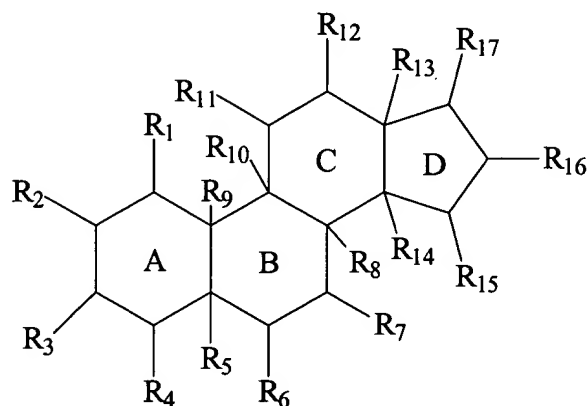


wherein n is 1-3, and R is selected from *n*-octyl, and trimethylethylammonio.

19. The compound of claim 1 having the formula:



20. A method of preparing the compound according to formula I



I

wherein fused rings A, B, C, and D are independently saturated or fully or partially unsaturated; and

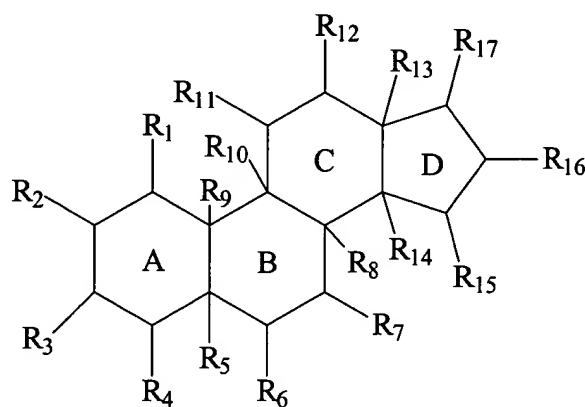
R_1 through R_4 , R_6 , R_7 , R_{11} , R_{12} , R_{15} , R_{16} , and R_{17} is each independently selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted arylamino- (C1-C10) alkyl, (C1-C10) haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, oxo, a linking group attached to a second steroid, a substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxamido, $H_2N-HC(Q_5)-C(O)-O-$, $H_2N-HC(Q_5)-C(O)-N(H)-$, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, $P.G.-HN-HC(Q_5)-C(O)-O-$, (C1-C10) guanidinoalkyl oxy, (C1-C10) quaternaryammoniumalkylcarboxy, and (C1-C10) guanidinoalkyl carboxy, where Q_5 is a side chain of any amino acid, P.G. is an amino protecting group, and

R_5 , R_8 , R_9 , R_{10} , R_{13} , and R_{14} is each independently:

deleted when one of fused rings A, B, C, or D is unsaturated so as to complete the valency of the carbon atom at that site, or

selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, C1-C10 haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, a linking group attached to a second steroid, a substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy, where Q5 is a side chain of any amino acid, P.G. is an amino protecting group, and

provided that at least two of R₁ through R₁₄ are independently selected from the group consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy, (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted arylamino- (C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, (C1-C10) quaternaryammonium alkylcarboxy, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy; or a pharmaceutically acceptable salt thereof; the method comprising contacting a compound of formula IV,



IV

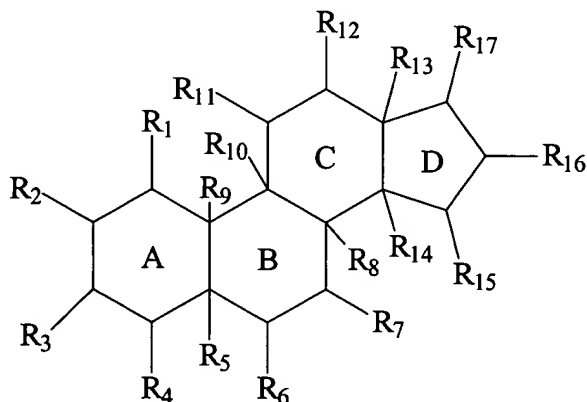
where at least two of R₁ through R₁₄ are hydroxyl, and the remaining moieties on the fused rings A, B, C, and D are defined for formula I, with an electrophile to produce an alkyl ether compound of formula IV, wherein at least two of R₁ through R₁₄ are (C1-C10)alkyloxy;

converting the alkyl ether compounds into an amino precursor compound wherein at least two of R₁ through R₁₄ are independently selected from the group consisting of (C1-C10) azidoalkyloxy and (C1-C10) cyanoalkyloxy; and
reducing the amino precursor compound to form a compound of formula I.

21. The method of claim 20, wherein the electrophile is allylbromide.

22. A method of producing a compound of formula I:

I



wherein fused rings A, B, C, and D are independently saturated or fully or partially unsaturated; and R₁ through R₄, R₆, R₇, R₁₁, R₁₂, R₁₅, R₁₆, and R₁₇ is each independently selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkylamino, (C1-C10) alkylamino-(C1-C10) alkylamino-(C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted arylamino-(C1-C10) alkyl, (C1-C10) haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, oxo, a linking group attached to a second steroid, a substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkyloxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxamido, H₂N-HC(Q₅)-C(O)-O-, H₂N-HC(Q₅)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q₅)-C(O)-O-, (C1-C10) guanidinoalkyl oxy, (C1-C10) quaternaryammoniumalkylcarboxy, and (C1-C10) guanidinoalkyl carboxy, where Q₅ is a side chain of any amino acid, P.G. is an amino protecting group, and

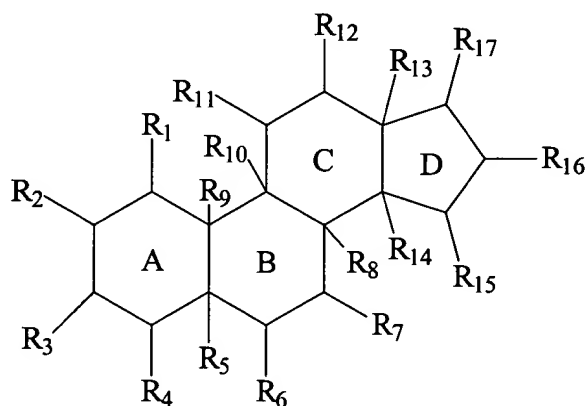
R₅, R₈, R₉, R₁₀, R₁₃, and R₁₄ is each independently:

deleted when one of fused rings A, B, C, or D is unsaturated so as to complete the valency of the carbon atom at that site, or

selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, C1-C10 haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, a linking group attached to a second steroid, a substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy, where Q5 is a side chain of any amino acid, P.G. is an amino protecting group, and

provided that at least two of R₁ through R₁₄ are independently selected from the group consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy, (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted arylamino- (C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, (C1-C10) quaternaryammonium alkylcarboxy, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy; or a pharmaceutically acceptable salt thereof;

the method comprising contacting a compound of formula IV,



IV

where at least two of R₁ through R₁₄ are hydroxyl, and the remaining moieties on the fused rings A, B, C, and D are defined for formula I, with an electrophile to produce an alkyl

51 ether compound of formula IV, wherein at least two of R₁ through R₁₄ are (C1-C10)
52 alkyloxy;
53 converting the alkyl ether compound into an amino precursor compound wherein at
54 least two of R₁ through R₁₄ are independently selected from the group consisting of (C1-C10)
55 azidoalkyloxy and (C1-C10) cyanoalkyloxy;
56 reducing the amino precursor compound to produce an aminoalkyl ether compound
57 wherein at least two of R₁ through R₁₄ are (C1-C10) aminoalkyloxy; and
58 contacting the aminoalkyl ether compound with a guanidino producing electrophile to
59 form a compound of formula I.

1 23. The method of claim 22, wherein the guanidino producing electrophile is HSO₃-
2 C(NH)-NH₂.

1 24. A pharmaceutical composition comprising an effective amount of a
2 compound of claim 1.

1 25. The pharmaceutical composition of claim 24, wherein the composition
2 includes additional antibiotics.

1 26. A method of treating a microbial infection of a host by administering to the
2 host an effective amount of an anti-microbial composition comprising a compound according
3 to claim 1.

1 27. The method of claim 26 wherein the host is a human.

1 28. The method of claim 26 wherein the anti-microbial composition further
2 comprises a second anti-microbial substance to be delivered into a microbial cell.

1 29. The method of claim 28 wherein the second anti-microbial substance is an
2 anti-biotic.

1 30. The method of claim 26 wherein the infection is a bacterial infection.

1 31. The method of claim 30 wherein the infection is a infection a Gram-negative
2 bacterial infection.

1 32. The method of claim 30 wherein the bacterial infection is an infection with a
2 bacterium characterized by an outer membrane comprising a substantial percentage of lipid
3 A.

1 33. A method of enhancing cell permeability by administering to the cell a
2 permeability-enhancing amount of the compound of claim 1.

1 34. The method of claim 33 further comprising administering to the cell a
2 substance to be introduced into the cell.

1 35. The method of claim 34 in which the cell is a bacterium.

1 36. The method of claim 35 in which the bacterium is a Gram-negative bacterium.

1 37. The method of claim 34 in which the cell is a sperm cell and the compound is
2 part of a spermicidal composition.

1 38. A method of identifying compounds effective against a microbe comprising
2 administering a candidate compound and a compound according to claim 1 to the microbe
3 and determining whether the candidate compound has a static or toxic effect on the microbe.

1 39. The method of claim 38 in which the microbe is a Gram-negative bacterium.

1 40. A method of microbial growth control comprising contacting a microbe with
2 an effective amount of anti-microbial composition comprising a compound according to
3 claim 1.

1 41. A composition of matter comprising the compound of claim 1 in combination
2 with an anti-microbial substance to be introduced into a cell.

1 42. A compound comprising a ring system of at least 4 fused rings, each of the
2 rings having from 5-7 atoms, the ring system having two faces, wherein the compound
3 comprises 3 chains attached to the same face of the ring system, each of the chains
4 containing a multiple nitrogen-containing group, wherein the multiple nitrogen-containing
5 group is separated from the ring system by at least one atom, and wherein the multiple
6 nitrogen-containing group is a (C1-C10) alkylamino (C1-C1) alkyamino group or a (C1-C10)
7 alkylamino (C1-C1) alkyamino (C1-C1) alkyamino group.

1 43. The compound of claim 42, wherein each of the multiple nitrogen-containing
2 groups is separated from the steroid backbone by at least two atoms.

1 44. The compound of claim 43, wherein each of the multiple nitrogen-containing
2 groups is separated from the steroid backbone by at least three atoms.

1 45. The compound of claim 44, wherein each of the multiple nitrogen-containing
2 groups is separated from the steroid backbone by at least four atoms.

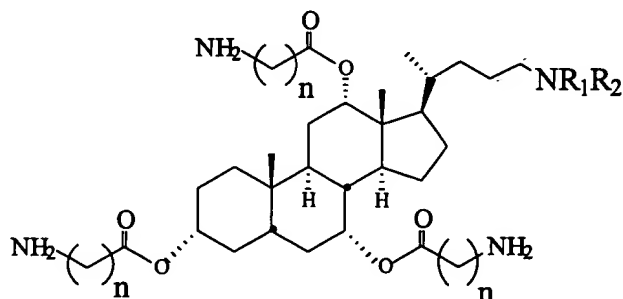
1 46. The compound of claim 42, wherein the compound further comprises a
2 hydrophobic group attached to the steroid backbone.

47. The compound of claim 42, wherein the hydrophobic group is selected from the group consisting of a substituted (C3-10) aminoalkyl group, a (C1-10) alkyloxy (C3-10) alkyl group, and a (C1-10) alkylamino (C3-10)alkyl group.

48. A pharmaceutical composition comprising an effective amount of a compound of claim 42.

49. A method of enhancing cell permeability by administering to the cell a permeability enhancing amount of the compound of claim 42.

50. A compound of claim 1 having the formula:

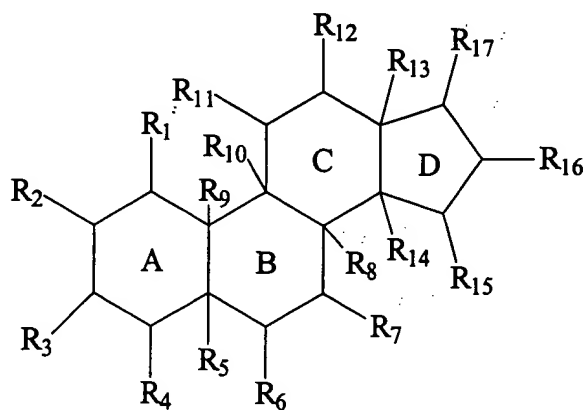


wherein R_1 is selected from hydrogen, or (C1-C10) alkylamino, R_2 is selected from (C1-C10) alkylamino or (C1-C10) alkylamino-(C1-C10) alkylamino, and n is 1-3.

51. The compound of claim 1, wherein R_1 is hydrogen and R_2 is (C1-C10) alkylamino-(C1-C10) alkylamino.

52. The compound of claim 1, wherein R_1 is (C1-C10) alkylamino, and R_2 is (C1-C10) alkylamino.

53. A compound according to formula I



I

wherein:

fused rings A, B, C, and D are independently saturated or fully or partially unsaturated; and

R₁ through R₄, R₆, R₇, R₁₁, R₁₂, R₁₅, and R₁₆, is each independently selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10) alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, a substituted or unsubstituted arylamino- (C1-C10) alkyl, (C1-C10) haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, oxo, a linking group attached to a second steroid, a substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, a substituted or unsubstituted (C1-C10) aminoalkylcarboxamido, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyl oxy, (C1-C10) quaternaryammoniumalkylcarboxy, and (C1-C10) guanidinoalkyl carboxy, where Q5 is a side chain of any amino acid, P.G. is an amino protecting group, and

R₅, R₈, R₉, R₁₀, R₁₃, and R₁₄ is each independently:

deleted when one of fused rings A, B, C, or D is unsaturated so as to complete the valency of the carbon atom at that site, or

selected from the group consisting of hydrogen, hydroxyl, a substituted or unsubstituted (C1-C10) alkyl, (C1-C10) hydroxyalkyl, (C1-C10) alkyloxy-(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyl, a substituted or unsubstituted aryl, C1-C10 haloalkyl, C2-C6 alkenyl, C2-C6 alkynyl, a linking group attached to a second steroid, a substituted or unsubstituted (C1-C10) aminoalkyloxy, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy, where Q5 is a side chain of any amino acid, P.G. is an amino protecting group, and

R₁₇ is selected from the group consisting of substituted or unsubstituted alkylcarboxyalkyl and protected or unprotected poly(aminoalkyl),

provided that at least two of R₁ through R₁₄ are independently selected from the group consisting of a substituted or unsubstituted (C1-C10) aminoalkyloxy, (C1-C10) alkylcarboxy-(C1-C10) alkyl, (C1-C10) alkylamino- (C1-C10) alkylamino, (C1-C10)

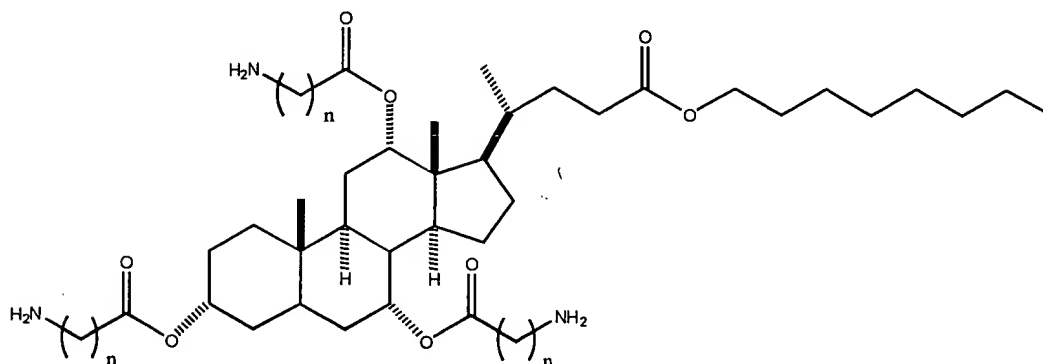
alkylamino- (C1-C10) alkylamino- (C1-C10) alkylamino, a substituted or unsubstituted (C1-C10) aminoalkylcarboxy, a substituted or unsubstituted arylamino- (C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkyloxy -(C1-C10) alkyl, a substituted or unsubstituted (C1-C10) aminoalkylaminocarbonyl, (C1-C10) quaternaryammonium alkylcarboxy, H₂N-HC(Q5)-C(O)-O-, H₂N-HC(Q5)-C(O)-N(H)-, (C1-C10) azidoalkyloxy, (C1-C10) cyanoalkyloxy, P.G.-HN-HC(Q5)-C(O)-O-, (C1-C10) guanidinoalkyloxy, and (C1-C10) guanidinoalkylcarboxy; or a pharmaceutically acceptable salt thereof.

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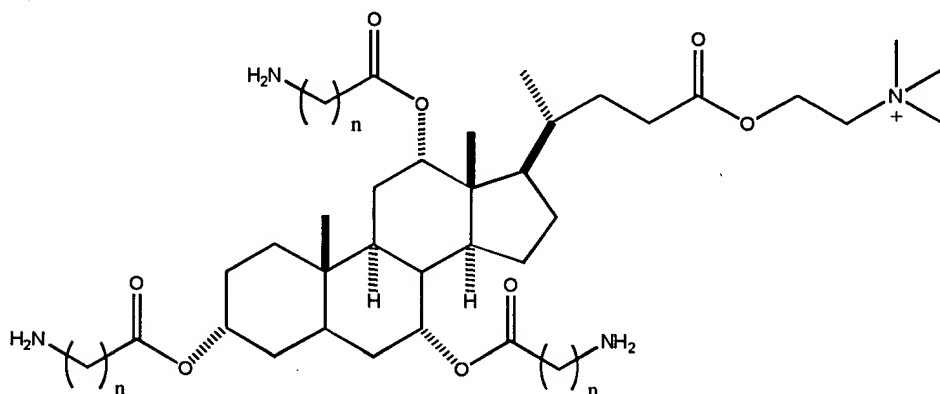
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54. The compound of claim 53, wherein the compound has the formula:



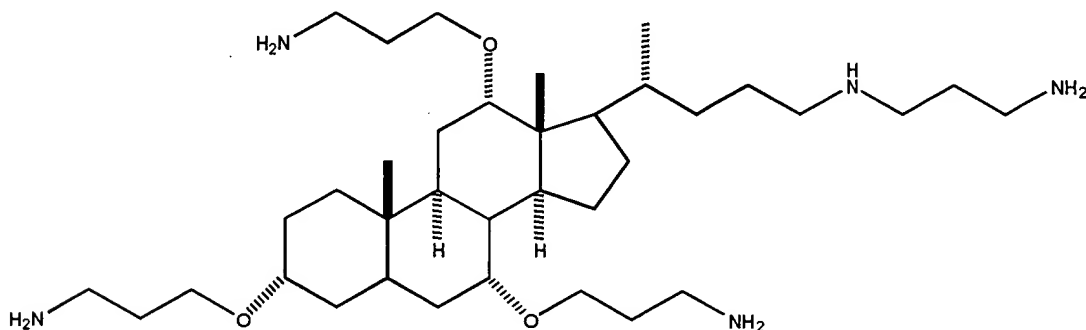
wherein n is 1-3.

55. The compound of claim 53, wherein the compound has the formula:

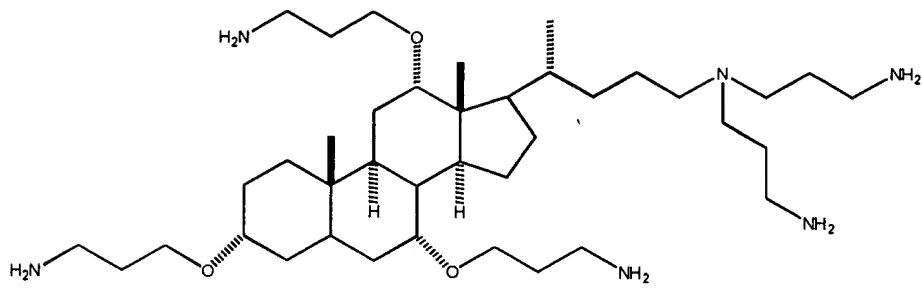


wherein n is 1-3.

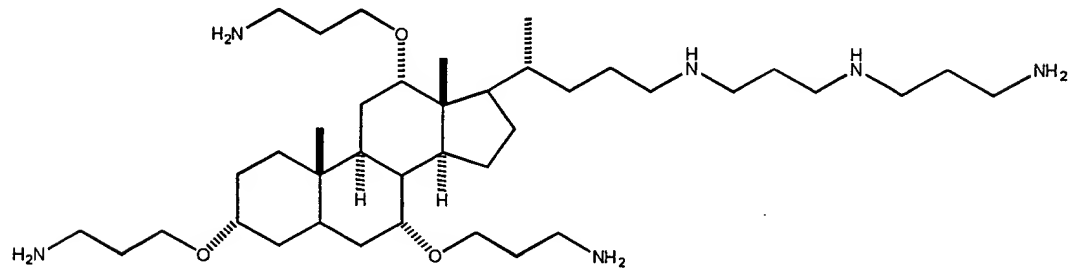
56. The compound of claim 53, wherein the compound has the formula:



57. The compound of claim 53, wherein the compound has the formula:



58. The compound of claim 53, wherein the compound has the formula:



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